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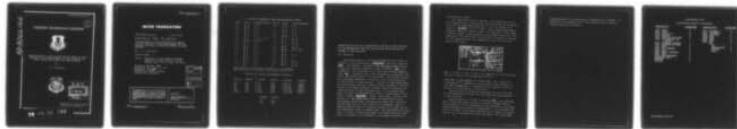
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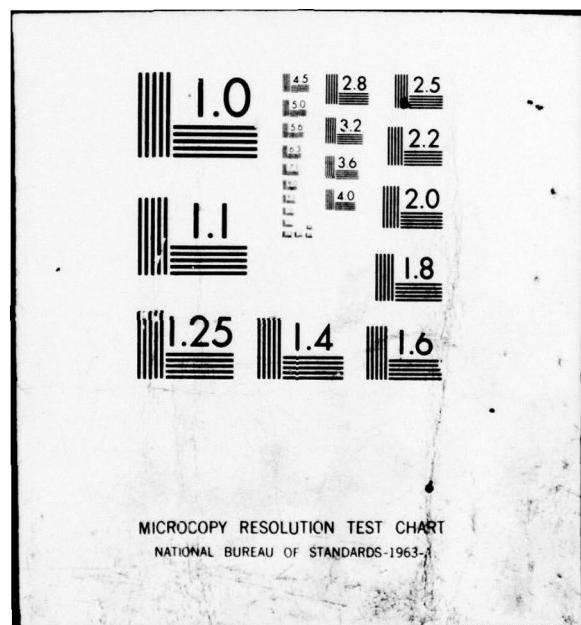
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CHARACTERISTICS OF THE ELECTRO-OPTICAL EFFECT IN CUBIC
CRYSTALS OF LEAD MAGNONIOBATE AND ZINC SELENIDE AND
THEIR USE FOR THE CONTROL OF LASER EMISSION

By

A. A. Berexhnoy



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By: A. A. Berexhnoy

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А а	А а	A, a	Р р	Р р	R, r
Б б	Б б	B, b	С с	С с	S, s
В в	В в	V, v	Т т	Т т	T, t
Г г	Г г	G, g	Ү ү	Ү ү	U, u
Д д	Д д	D, d	Ф ф	Ф ф	F, f
Е е	Е е	Ye, ye; E, e*	Х х	Х х	Kh, kh
Ж ж	Ж ж	Zh, zh	Ц ц	Ц ц	Ts, ts
З з	З з	Z, z	Ч ч	Ч ч	Ch, ch
И и	И и	I, i	Ш ш	Ш ш	Sh, sh
Й й	Й й	Y, y	Щ щ	Щ щ	Shch, shch
К к	К к	K, k	Ь ь	Ь ь	"
Л л	Л л	L, l	Ҥ ҥ	Ҥ ҥ	Y, y
М м	М м	M, m	Ӯ Ӯ	Ӯ Ӯ	'
Н н	Н н	N, n	Ҹ ҹ	Ҹ ҹ	E, e
Ӧ Ӧ	Ӧ Ӧ	O, o	Ӥ ӥ	ӥ ӥ	Yu, yu
Ӫ Ӫ	Ӫ Ӫ	P, p	Ӣ Ӣ	Ӣ Ӣ	Ya, ya

*ye initially, after vowels, and after ь, ь; e elsewhere.
When written as ё in Russian, transliterate as yё or ё.

RUSSIAN AND ENGLISH TRIGONOMETRIC FUNCTIONS

Russian	English	Russian	English	Russian	English
sin	sin	sh	sinh	arc sh	\sin^{-1}
cos	cos	ch	cosh	arc ch	\cosh^{-1}
tg	tan	th	tanh	arc th	\tanh^{-1}
ctg	cot	cth	coth	arc cth	\coth^{-1}
sec	sec	sch	sech	arc sch	\sech^{-1}
cosec	csc	csch	csch	arc csch	\csch^{-1}

Russian	English
rot	curl
lg	log

CHARACTERISTICS OF THE ELECTRO-OPTICAL EFFECT IN CUBIC CRYSTALS OF LEAD MAGNONIOBATE AND ZINC SELENIDE AND THEIR USE FOR THE CONTROL OF LASER EMISSION

A.A. Berexhnay

The characteristics of the electro-optical effect (EOE) in crystals of lead magnoniobate $Pb_2Nb_2O_6$ and zinc selenide $ZnSe$ are examined. Crystals of the lead magnoniobate belong to the cubic centrally symmetric class of symmetry $m\bar{3}m$, and crystals of zinc selenide, to the cubic noncentrally symmetric class $\bar{4}3m$. Observed in the first crystals is the quadratic EOE and in the second crystals, the linear EOE. The optical isotropy and considerable EOE make it possible to use them effectively for the control of laser emission. Crystals of lead magnoniobate are ferroelectric and have a diffused phase transition. The diffusion of the phase transition in these crystals determines the characteristics of their EOE properties. It is revealed that under the effect of the electrical field E , linearization of the EOE in crystals $Pb_2Nb_2O_6$ occurs. When $E > E_0 = 4$ kV/cm, the crystals of lead magnoniobate behave as piezoelectrics, i.e., they possess piezoelectric resonance and linear EOE. When E is applied along [001], it goes over into a tetragonal class of symmetry $4mm$, and when it is applied along [011] it goes over to the rhombohedral class of symmetry $mm2$. The characteristic of the EOE in crystals of lead magnoniobate is discussed from the viewpoint of concepts on the dispersion of the phase transition in

ferroelectric crystals.

The longitudinal EOE is examined. The combination of the EO [Electro-optical] coefficients, which determine the longitudinal effect at room temperature and $\lambda = 0.63 \mu\text{m}$, proved to be equal to $(R_0 - R_2 - R_4) = 6.4 \cdot 10^{-13} \text{ cm/V}^2$. Such a large longitudinal quadratic effect is connected with the disruption of the oxygen octahedron owing to the dispersion of the phase transition. The magnitude of EO coefficients and half-wave voltages for crystals of lead magnoniobate at room temperature and $\lambda = 0.63 \mu\text{m}$ are given in the table:

$R_0 \cdot 10^{12} \text{ cm/V}^2$	$T_0 \cdot 10^8 \text{ cm/s}$	$V_{1/2} \cdot \text{kV}$
$R_0 = 1.40$	для симметрии 4)	для поперечного з-декта
$R_2 = 0.08$	$T_0 = 167,0$	при $E < E_0$ $V_{1/2} = 3.2$
$R_4 = 0.67$	$T_0 = 8.2$	при $E > E_0$ $V_{1/2} = (0.11f + 3.4) d$
	для симметрии 2)	для продольного з-декта
	$T_0 = 69.0$	при $E < E_0$ $V_{1/2} = 3.4 d$
	$T_0 = 3.8$	при $E > E_0$ $V_{1/2} = (0.32 + 4.9 d) d$

KEY: 1) cm/V^2 ; 2) cm/V ; 3) kV; 4) For symmetry; 5) For transverse effect; 6) when; 7) For longitudinal effect.

where R_0 is the quadratic EO coefficients, T_0 - linear EO coefficients, f - dimension of the crystal in the direction of the light propagation, d - dimension of the crystal in the direction of the application of the field.

Possibilities are discussed concerning the use of the EOE in lead magnoniobate crystals for the deflection and modulation of laser emission.

Characteristics of the EOE in crystals ZnSi_2 are connected with a large photoeffect, which is observed in these crystals. The dependence of the EO parameters on the intensity of the light passing through the crystal is investigated. It is revealed that with an increase in the light intensity by two orders, the magnitude of $V_{1/2}$ is increased by almost one order. The time charac-

characteristics of the photoelectric parameters are studied. In conclusion, the possibilities of the practical use of the discovered effect are discussed.

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